

October 1, 1958 - March 31, 1959

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NORTHEASTERN FOREST EXPERIMENT STATION

Division of Watershed Management Research

Semi-annual Report

April 1959

GENERAL

During the past six months arrangements were made for transfer of the watershed project at Kingston, Pa. to New Lisbon, N. J. and a more diversified program. The treated watersheds at the Fernow continued to provide interesting results, 32 snow courses were laid out in the Adirondacks for a study of snow accumulation and melt, and a survey of humus depth in virgin areas was completed.

KINGSTON RESEARCH CENTER

Completion of the Dilldown calibration and beginning of conversion of this watershed to conifer cover completed the initial effort in watershed research at this Center. Recent developments in cooperative research at Baltimore, Maryland, State College, Pennsylvania, and Newark, New Jersey have prompted us to consolidate supervision of these studies and move headquarters to a more central location at our New Lisbon Research Center in New Jersey.

Reigner will take over these larger responsibilities about May 1. Art Eschner, who has worked with Reigner for the past 4 years, has been transferred to our Elkins Center to join the Fernow watershedders.

Before closing the project at Kingston, two major manuscripts will be completed. The first is the results of the single-watershed calibration analysis for Dilldown which will be published as a Station Paper (the long version) and likely in the AGU Transactions (the short version). Also, to complete our publications of research progress and data from Dilldown, we have started work with the Department of Forests and Waters on Dilldown Report No. 4 which will contain 4 years results and data.

ELKINS RESEARCH CENTER

Treated Watersheds

In December, logging was finished on Watershed No. 3. Now the initial treatments are complete on the original "Fernow Five" gaged

watersheds. The four treatments are commercial clearcut, diameter limit (16"), extensive selection, and intensive selection; one watershed is a control and received no treatment.

Discharges for the first two watersheds cut were as follows:

Streamflow						
Clearcut 1/			Diameter-limit 2/			
Pre- dicted 3/	Meas- ured	In- crease	::	Pre- dicted 3/	Meas- ured	In- crease
May - Oct. 1957	2.5	3.8		--	--	--
Nov. 1957 - Apr. 58	16.5	17.4		--	--	--
May 1958 - Nov. 58	13.0	17.5		14.9	15.8	0.9
		6.7				0.9

1/ Clearcutting started May 15, 1957, completed June 15, 1958.

2/ Diameter-limit cutting started June 23, 1958 and was completed August 22, 1958.

3/ If watershed had not been cut.

All increases shown in the above table were significant at the 5 percent level. The increase shown for the diameter-limit cut is small but most of the watershed had not been cut over in that part of the period which contributed most to streamflow.

Turbidities during storm periods are still high on the clear-cut and diameter-limit watersheds with their loggers-choice skidroads. Turbidities are less than during logging; further measurements and analysis are required before the rate of recovery can be determined.

A small amount of turbidity during storm periods has been noted in the extensive selection watershed. A maximum value of 210 was measured during the logging operation. Road standard in this practice permit grades not exceeding 20 percent except for short stretches.

No measurable turbidity has been noted in the intensive selection watersheds. Standards here do not permit grades over 10 percent except for short stretches where steeper grades are unavailable. Special care is taken to locate the road away from stream channels and to prevent logging disturbance in or near the streambed.

A working plan was completed for the two openland watersheds recently established near Parsons.

### Soil Moisture Measurement

Soil Moisture measurements to determine differences in soil-moisture loss on the clearcut and control watersheds were inconclusive. This may have been at least partly because we had a very wet summer and only a low degree of soil drying at any location. Highest values obtained were only a few percent above the lowest.

In October, 1958, a round of gravimetric sampling was made; six points on each of six plots in each of 3 watersheds were sampled. Taking of 6 samples per plot instead of the 2 previously taken apparently increased accuracy to the point where results are satisfactory. Analysis indicates that the standard error of the watershed mean (based on 36 measurements) was less than 1 percent for the second foot of soil depth.

The results of the neutron meter measurements that were taken were good. However, conclusions as to effects of treatments could not be drawn because of the small amount of sampling and the small range in moisture contents as discussed above.

### Electronic Computer

In common with many others, we have been trying to see how the electronic computers could take over part of our analysis job. In line with this, daily streamflow for 5 watersheds for 7 years of record has been punched and run through the IBM 650. The punching was by IBM Service Bureau; the IBM 650 at Yale did the rest of the work. We now have sums and sums of squares and crossproducts to prepare regressions relating daily flow of each watershed to each of the others. Separate regressions can be computed for each month of the year, for the growing season, for the dormant season, and for the record as a whole. With these, predicted and daily flows can be plotted. These should be good for demonstration purpose and should facilitate study of the data to determine when and why we get the streamflow increases that show up in our more general analysis. We are also getting flow-duration curves by months and for the record as a whole for all watersheds.

### Miscellaneous

George Hart and John Phillips left us in January. George transferred to Laconia while Phillips returned to the University of Wisconsin for graduate work in forestry. Art Eschner and family moved to Parsons in February. Art is working principally in watershed management research. Ken Reinhart spent the fall in Upper Darby taking the Station's "B Course" in statistics. Harry Yawney attended the statistical school in Laconia.

## LACONIA RESEARCH CENTER

### General

The vacancy in our watershed staff created by Dick Sartz' departure in August was filled by George Hart's transfer in January from the Fernow Experimental Forest in West Virginia. Since his arrival, George has become New Hampshire's number one outdoor enthusiast--seems he can't get enough of snow, snowshoeing, skating, and skiing. Needless to say the local hospital and sporting goods stores are also happy George is here.

The building which was part of the property we acquired last fall for an administrative site has been remodeled as a residence. Ray Lavigne, our resident superintendent at Hubbard Brook, has moved his family into this dwelling.

Watershed activities have been drastically curtailed lately as Leonard, Hart, and Pierce are attending the Station's five-week Statistics Course A at Laconia. Lavigne and pinch-hitter James Clemons are maintaining our installations and gathering the snowballing winter data at Hubbard Brook.

A regularly scheduled monthly forestry seminar has been launched in Laconia. As the number of professional personnel and the type of activities has mushroomed at this Center in recent years a need was felt to provide a means of group communication of research problems among the staff members and other interested parties. One or two persons will be in charge of the hour long seminar and they will be free to discuss any forestry topic concerning items such as proposed studies, new techniques, or completed work. The seminar sessions will not be held during the summer field season.

Copies of the thesis on Landslides in the White Mountains of New Hampshire by Edward Flaccus (awarded a Ph.D from Duke University in October--now teaching botany at the Duluth Extension at the University of Minnesota) as reported in the last semi-annual are available on loan.

### Watershed Activities

Unlike our past four winters we have not had a midwinter thaw. Several rains of about one inch or greater were completely absorbed in the snow pack with little or no resulting runoff. Our essentially frost-free forest soil now has a four-foot-thick blanket of snow bearing 10 inches of water. The Army surplus weasel we acquired last spring has proven its mettle this winter by bucking monstrous drifts and striding up slopes covered with non-supporting snow. With the weasel we are able to cut former transportation time in half and incidently reduce wear and tear on us aging watershedders.

The throughfall portion of our interception study which has been carried on this winter has yielded some interesting data. Our records to date show that our northern hardwood sawtimber stands intercept about 12% of the precipitation (as rain and snow) during the leafless period as compared to 26% of the precipitation (as rain) during the summer leaf period.

Our tests to date indicate there is no significant difference in precipitation catch between gages having tilted Alter windshields (tilted with the slope) and gages having non-tilted windshields (horizontal). Further tests will be conducted to determine if there is a need to shield our gages or if we are gaining much by tilting the gages.

### Strip-Mine Revegetation

While at the Fernow last summer, Hart conducted a study of seedling survival of planted stock on strip-mine banks in central and western Pennsylvania. Although a detailed report of his findings will be published elsewhere, there are some interesting sidelights regarding soils information. The strip-mine banks were formed between 10 and 15 years ago and planted shortly thereafter with various tree species. The predominant surface material is blue and tan shale which decomposes rapidly. The soil content (material less than 2 mm.) on these banks is usually less than 50%. Red oak showed much better growth and slightly better survival on fine-textured soils.

#### Survival and height growth for Red Oak

	10-year height (feet)	Survival (percent)
Fine-textured soils (70% or greater silt and clay)	10.9	68
Coarse-textured soils (70% or less silt and clay)	7.4	57

Green and white ash appear to show this tendency to a lesser degree. Performance of conifers with respect to soil texture was highly variable with no apparent trends.

Soil acidity on most test areas was between pH 3.5 and 5.0. As these banks had pH's which fell within this same range 10 years ago, it is assumed that changes in soil reaction for this period on strip-mines in this region appear very slight. Tree survival on banks having pH's 3.2 and 3.3 was almost a complete failure for all species tested. Survival was much higher for most species on banks with pH's of 3.6 and above.

## Miscellaneous

Pierce spoke to the Rotary Club at Laconia in January regarding watershed research in the White Mountains of New Hampshire. Leonard, Hart, and Pierce attended the National Conference on Agricultural Meteorology in New Haven, October 22, 1958. Pierce visited the Hopkins Memorial Experimental Forest to confer with Cunningham on prospects of improving the Williamstown watersheds. Hart and Pierce attended the Eastern Snow Conference in Cambridge, February 6.

## PUBLICATIONS

Calibration of five small forested watersheds. Kenneth G. Reinhart. Trans. Amer. Geophys. Union 38: 933-936.

Better water through forest management. In Better Water Through Forestry and Engineering. Howard W. Lull. Interstate Comm. on the Potomac River Basin, pp. 10-19, Mineo.

The management of forested watersheds in New England. Howard W. Lull and Norman R. Tripp. Jour. New England Water Works Assoc. 72: 341-349.

Poor logging makes muddy streams. Kenneth G. Reinhart and John J. Phillips. West Va. Conserv. 22: 20-23.

Soil compaction on forest and range lands. Howard W. Lull. U. S. Dept. Agri. Misc. Pub. 768. 33 pp., illus.

Changes in woodland vegetation and soils after spraying large amounts of waste water. Silas Little, Howard W. Lull and Irwin Remson. Forest Sci. 5: 18-27.

Logging roads on Northeastern municipal watersheds. George R. Trimble, Jr. Jour. Amer. Water Works Assoc. 51: 407-410.

## Manuscripts Submitted

The effect of scrub oak and related ericaceous ground cover on soil moisture. Arthur R. Eschner.

Humus depth in the Northeast. Howard W. Lull.